ARS Research on Global Climate Change Adaptation

The Agricultural Research Service conducts research on global climate change because agriculture is both vulnerable to and contributing to climate change. As recognized pioneers in the science of climate change, ARS researchers have made significant contributions to international and domestic reports documenting the impacts of climate change on agriculture. The basic understandings contained in these reports are providing the foundation for research to develop climate change adaptation strategies for agriculture.

Such research seeks to prepare agriculture for the direct effects of climate change, such as those from precipitation and temperature, and its indirect effects, such as increased threats from invasive weeds, pathogens, and insects.

Climate change also offers potential benefits to agriculture. Longer growing seasons may offer opportunities for multiple crops during a single season. The additional carbon dioxide in the atmosphere, which poses a threat with its fertilizing effects on weeds, may also offer opportunities for enhanced crop production, especially if varieties and agricultural management systems are developed that can take advantage of the change.

ARS has also pioneered investigations of agriculture's potential for mitigating the factors affecting global climate change, for instance by sequestering carbon in soil. But agriculture emits other greenhouse gases to the atmosphere, most notably nitrous oxide and methane. ARS's Greenhouse Gas Reduction through Agricultural Carbon Enhancement Network (GRACEnet), a project coordinated across 32 ARS locations, is evaluating soil carbon status and change in conventional and alternative agricultural systems and determining the net greenhouse gas emissions from those systems.

National and regional databases of carbon sequestration and greenhouse gas emissions being built as a part of GRACEnet will provide the reference information needed by scientists, policymakers, regulatory officials, producers, and ultimately the general public to quantify the impact of agriculture on climate and develop mitigation strategies.

The ultimate goal of climate change mitigation research is to position agriculture so that it can become "carbon-neutral," meaning that agriculture captures as much carbon as it emits and potentially becomes a net sink for carbon.

Understanding the impacts of the many interacting factors of global climate change, agriculture, and managed and natural ecosystems is a complex task requiring the wide array of scientific expertise that ARS has available. Our climate change research involves the resources of more than a dozen national programs, with the primary one being #204, Global Change. ARS also collaborates with scientists in many other federal, state, industrial, and international organizations.

Climate change represents a threat and potentially an opportunity for agriculture. ARS's research is helping to make agricultural and natural resource systems more resistant to climate change. ARS is also enabling agriculture to reduce its impact on climate with research on greenhouse gas mitigation. ✸